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Zaire

April 1973

NATIONAL INTELLIGENCE SURVEY

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Military Geography

NATIONAL INTELLIGENCE SURVEY PUBLICATIONS

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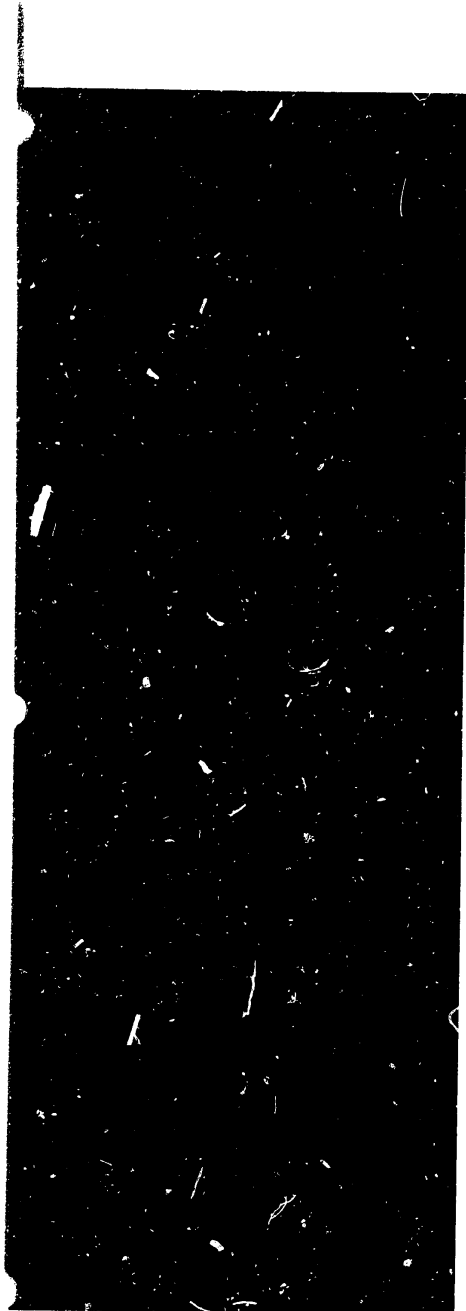
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*This chapter was prepared for the NIS by the
Defense Intelligence Agency. Research was sub-
stantially completed by January 1973.*



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Military Geography

A. Location and description (U/OU)

The Republic of Zaire is located on the Equator and extends east-west across about two-thirds of central Africa, sharing borders with nine other countries. The mineral-rich Shaba Region in the southeast is adjacent to the important copper-producing areas in Zambia.

The country, comprising 905,000 square miles, is about the size of the United States east of the Mississippi River; maximum distances are about 1,200 miles¹ east-west and north-south. The population, 23,918,000 (January 1973 estimate), is about the same as that of New York State.

1. Topography

The terrain consists mainly of high plains between 1,000 and 3,000 feet above sea level (Figures 1 and 17) bordered by a belt of rugged hills in the west. The central part, the Congo River Basin, is characterized by flat plains 1,000 to 1,500 feet above sea level and dense broadleaf evergreen forest (Figure 2) containing numerous species of large and small trees and thick secondary growth of bushes, saplings, vines, and herbaceous plants (Figure 3). In the western lower Congo River area, a narrow flat coastal plain ranging from sea level to about 150 feet is covered by dense broadleaf evergreen forest or by marshes and swamps. Elsewhere, the plains in the north and south are predominantly rolling or dissected, slopes are from 2% to 10%, and interstream areas 100 to 500 feet above the adjoining streams. Locally there are termite mounds 10 to 20 feet high and 5 to 10 feet wide. Part of the northern and much of the southern plains are covered by savanna, which consists of dense grass (Figure 4) 4 to 15 feet high and scattered clumps of trees and shrubs; dense broadleaf evergreen forest is extensive in the northern plains. In the southeast, there are open to dense stands of deciduous tall brush (Figure 5), shrubs, and interspersed grassy areas. Widespread marsh of dense papyrus, reeds, and floating grass, occurs along the lower Ubangi river,

¹Distances are in statute miles unless, nautical miles are specifically stated.

along most of the Congo River between Bumba and the confluence with the Kwa river, and along some lakes and streams in the southeast.

Numerous streams over 500 feet wide and 3.5 to more than 6 feet deep wind across the plains and in many places overflow their low, gently sloping earth banks and inundate extensive low-lying areas and swamps during high water (generally September through December north of the Equator and March to mid-June and mid-September through January south of the Equator). The Congo River, whose watershed encompasses nearly all of the country, is mostly 2 to 8 miles wide and more than 6 feet deep; in places during high water, it is nearly 300 feet deep. South of Kisangani, where the Congo River is known as the Lualaba, it is nearly 1 mile wide in places. Other large rivers include the Ubangi, Kwa, Kasai, and Lomami, which are 1,000 feet to 3 miles wide in many places. In the rolling or dissected plains, the upper courses of some streams are incised between high, steep, rocky banks.

In most places, the plains have coarse- and fine-grained soils 20 feet or more thick; however, in many parts of the south, hard laterite and rocks are near the surface. The ground is firm except after heavy rains for periods of generally less than a day about 4 to 8 times per month from early October through April south of about 4°S, and early April through October north of 2°N. In the marshes and swamps of the central plains and along the coast, the ground is always miry.

Hills and rugged mountains are along the eastern periphery of the country, and low, rolling hills are in the west. In the east, the hills have sharp crests, which are 3,000 to 5,000 feet above sea level and 1,000 to 2,000 feet above the adjoining valley floors; in western Zaire, hill summits are rounded (Figure 6) and range from about 700 to 2,000 feet above the adjacent stream valleys and plains. Throughout the hills, slopes are commonly 10% to 30%, although along some streams there are short escarpments that have slopes in excess of 100%. In the eastern mountains, summits are jagged and rise 5,000 to 10,000 feet above sea level and more than 2,000 feet above valley floors. A small area of snow-covered peaks is more than 16,000 feet

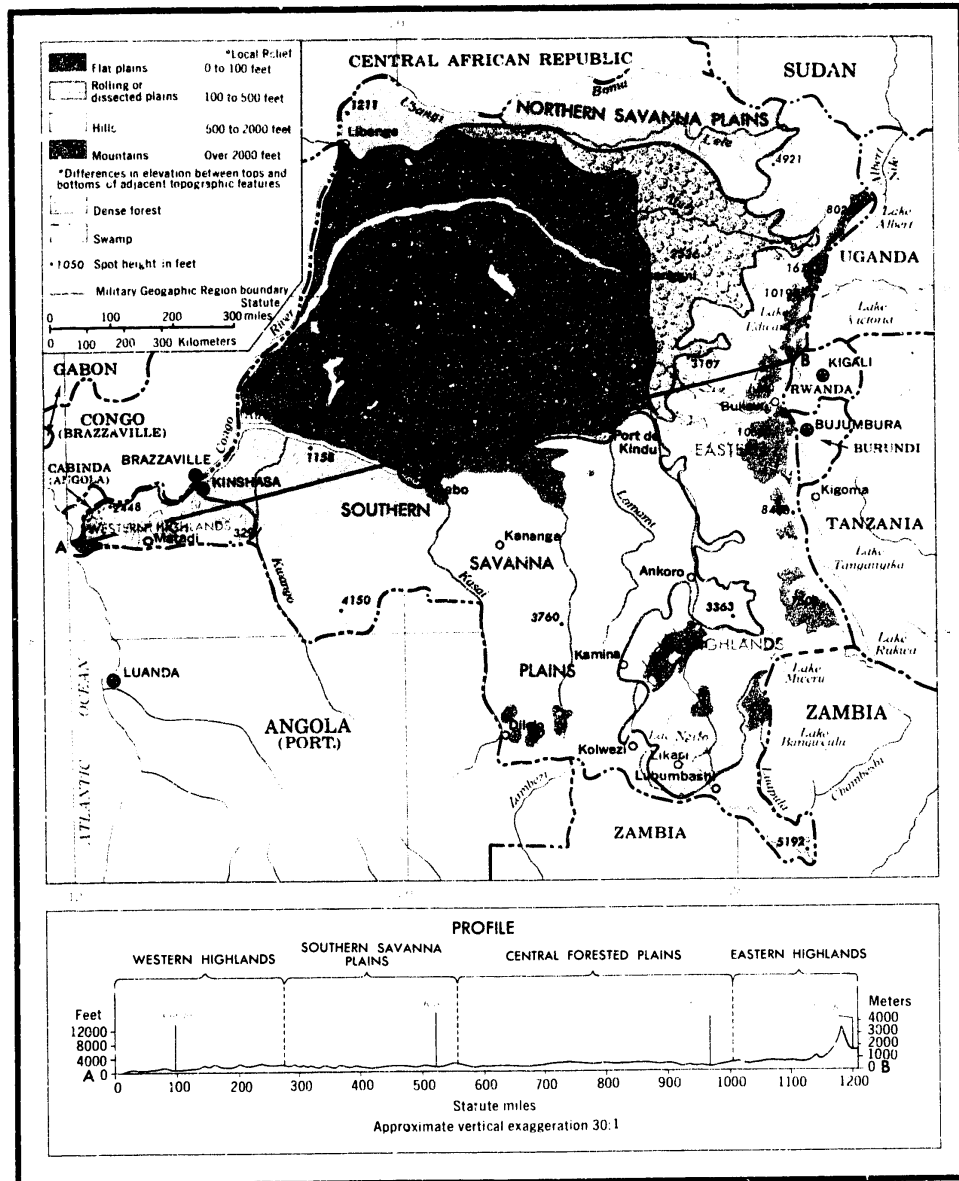


FIGURE 1. Military geographic regions and terrain (C)



FIGURE 2. The dense broadleaf evergreen forest that blankets most of the central Congo River Basin contains many kinds of trees 20 to 80 feet high, in one or more stories; trunk diameters are 1 to 2 feet (C)

above sea level (Figure 7). Slopes primarily range from 30% to 60%. The north-central and central parts of the eastern highlands are covered largely by dense broadleaf evergreen forest; elsewhere, the highlands are covered by savanna except for scattered areas of dense brush in the southeast and small areas of dense bamboo and alpine brush and scrub on the higher mountain slopes. The hills in the lower Zaire are

covered mainly by savanna and scattered areas of dense broadleaf evergreen forest. Most streams in the hills and mountains are less than 300 feet wide and flow between high, steep banks in steep-sided valleys. The banks primarily are composed of rock and the bottoms of boulders, cobbles, and rock.

Culture features generally are sparse and consist primarily of a few cities and towns, scattered rural villages, several large mines, some areas of irrigation and terraces, a few dams and reservoirs in the southeast and along the eastern periphery, a sparse road and railroad network, and numerous airfields. The cities and larger towns have modern sections containing broad-paved streets and mostly one- and two-story masonry structures, and slum sections containing narrow earth streets and wattle and daub or mudbrick huts having thatched roofs. Kinshasa has many tall buildings constructed of steel and concrete (Figure 8). Rural villages, which are mainly in the west along the Congo River and in the southern and eastern limits of the country along rivers and roads, consist of round wattle and daub huts with thatched roofs. Most mines are around Lubumbashi and Kolwezi and, except for two shaft mines, are large open-pit operations from which copper ore is extracted (Figure 9). The irrigated areas are mainly rice fields along the Lualaba and Lomami rivers and near



FIGURE 3. Dense jungle undergrowth, such as this near Kisangani, is rampant along roads and other types of openings in the dense forests. The undergrowth is a wild impenetrable tangle of bushes, saplings, vines, palms, and herbaceous plants. (U/OU)



FIGURE 4. Tall-grass savanna, such as shown here during the rainy season near Kenge in southwestern Zaire, consists of dense grass, 4 to 15 feet high, commonly in tussocks (C)

Bumba along the Congo; cultivated terraces are locally on hill and mountain slopes in the east. Rivers afford the primary means of transportation, although during low water only shallow draft craft can navigate most rivers. The rivers are supplemented by a sparse network of tracks and roads and railroads. Most roads are earth, one to two lanes, and in poor condition. The few railroads are single track, mainl. 3'6" gage, and in fair condition. There are numerous airfields with hard surfaced runways over 6,000 feet long; the largest, southeast of Kinshasa, has a concrete runway over 12,000 feet in length.



FIGURE 5. Deciduous tall brush, with many grassy openings, is common in the southeastern part of the country. The grass between the trees may be burned annually. (U/OU)



FIGURE 6. These deeply dissected hills extend north-south across the narrow panhandle of western Zaire. Summits are rounded and in some places are more than 3,000 feet above sea level. (C)

2. Climate

The climate of Zaire is essentially tropical except in the eastern mountains. However, the annual north-south migration of the intertropical convergence zone (ICZ) across the country causes pronounced climatic differences between regions. In a narrow zone along the Equator the climate shows little variation



FIGURE 7. The mountains along the eastern boundaries of Zaire primarily are steep and many are rugged, sharp crested, and snow capped. These, north of Lake Edward, have local relief of more than 2,000 feet. Slopes are more than 30%. (U/OU)



FIGURE 8. Kinshasa, the largest and most important city in Zaire, has many broad avenues lined with tall buildings constructed of steel and concrete. Although densely built up, the city has many trees. (U/OU)

throughout the year, whereas north and south of this zone definite wet and dry seasons (Figure 10) are regulated by the length of time the ICZ is present over each region.

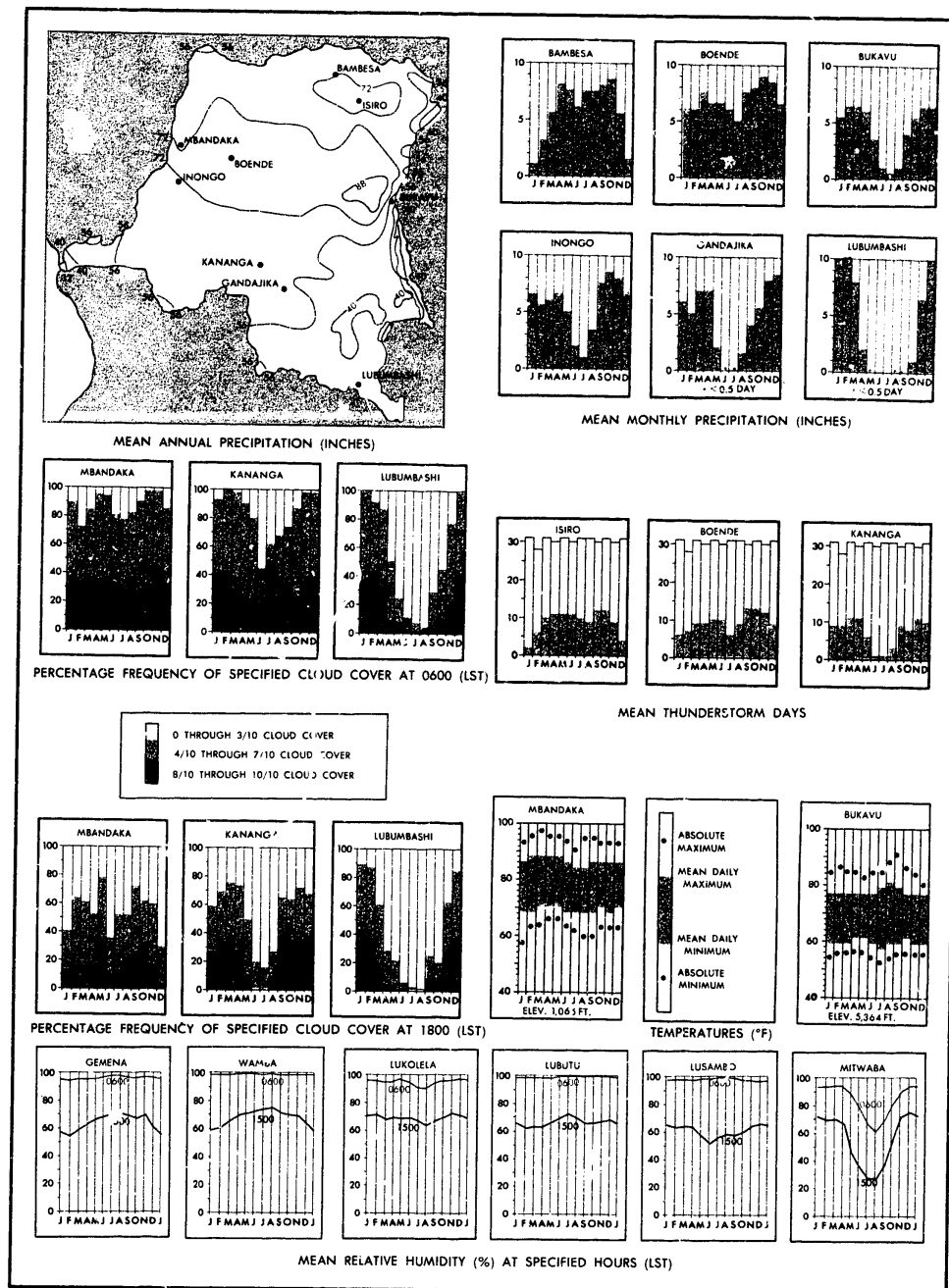
The narrow equatorial zone experiences a monotonous and enervating type of weather in all months. Temperatures and relative humidity are



FIGURE 9. Almost all the copper mines are the open-pit type, and ore is excavated along benches by power shovels to depths of 100 to 130 feet (U/OU)

persistently high, cloudiness is abundant, and rainfall, although not excessive, is plentiful. The greatest changes in the weather, in fact, are the diurnal variations. Temperatures normally rise to afternoon maximums in the 80's (°F.) and low 90's and decrease to early morning minimums in the upper 60's and low 70's. The only relief from the heat is at the higher elevations in the east, where the daily maximums and minimums are 10 to 20 Fahrenheit degrees colder and freezing temperatures occur at the highest elevations. Average relative humidity varies between morning maximums in the 90's (%) and afternoon minimums in the 60's and low 70's; the hot and humid conditions are most oppressive to humans. Skies are cloudiest near dawn and least cloudy near sunset. Showers are frequent, mostly during the afternoon, producing average monthly amounts mainly between 4 and 9 inches. The most intense falls are during thunderstorms, which normally occur on 5 to 10 days monthly. The heaviest precipitation in the country falls over the eastern highlands, where orographic rains produce annual totals approaching 90 inches. Visibility is good throughout the day except during morning fogs, which rapidly dissipate after sunrise, and during the brief showers. Strong surface winds occur only during thunderstorm activity.

The remaining regions north and south of the equatorial zone experience a similar uniform



6 FIGURE 10. Precipitation, cloud cover, thunderstorm days, temperatures, and relative humidity (U/OU)

temperature regime, with seasonal changes averaging less than 10 degrees even over the sections farthest from the equator. However, other climatic elements undergo marked seasonal changes. During the wet season, April through October north of the equatorial zone and November through March south of this zone, mean monthly rainfall ranges mostly from 5 to 10 inches and thunderstorms occur generally on 5 to 15 days per month. Cloudiness in this season is extensive, with frequent overcasts, and visibility is generally good except during showers and morning fogs. Relative humidity, however, is persistently high and, with the high temperatures, creates an enervating condition. During the dry season, December through February in the north but as long as April through October in the far south, monthly rainfall normally is less than 3 inches at most locations. Skies are frequently clear or partly cloudy, visibility is usually excellent, and winds are light, often calm. Afternoon relative humidity is lower at this time, especially in the southern regions, where afternoon humidities often drop below 40%.

B. Military geographic regions (C)

Zaire has five military geographic regions, the Central Forested Plains, Northern Savanna Plains, Southern Savanna Plains, Eastern Highlands and Western Highlands (Figure 1). The combination of environmental conditions within each region would have a relatively uniform effect on military operations, but there would be marked differences between the regions.

1. Central Forested Plains

This region is unsuited for large-scale conventional ground operations. Cross-country movement of tracked and wheeled vehicles would be precluded by dense forest and large marshy areas, and the numerous wide and deep rivers and periodic flooding would require extensive river-crossing operations. Movement on the widely spaced, earth roads and tracks would be hindered much of the time by washouts, soft surfaces, and flooding. Numerous fords and ferry crossings are potential bottlenecks. Offroad dispersal would be precluded. Construction of new roads would require extensive clearing and building many bridges and culverts with raised approaches. Rocks suitable for crushing are lacking. In addition, work frequently would be stopped by miry ground, and the rapid growth of vegetation along the roadways necessitates periodic cutting of bushes and vines. The dense forest of large trees, however, affords excellent concealment

from air and ground observation and some cover from flat-trajectory fire. The dissected terrain in the north and east provides additional concealment from ground observation and cover from flat-trajectory fire. Construction of bunker-type installations would be extremely difficult because of a high water table, and flat terrain and thick, unstable soils over the bedrock preclude tunnel-type installations.

Airborne and airmobile operations would also be difficult. The few sites suitable for parachute drops and helicopter landings are small scattered clearings and grassy areas in dense forests and marsh. Assault-type aircraft could land at airfields near Mbandaka, Kisangani, Libenge, and Port de Kindu. Construction of additional airfields would necessitate extensive clearing and much grading and filling to provide adequate drainage and firm foundations. Hard rocks suitable for crushing are lacking.

Conditions are good for irregular forces operations. Excellent concealment from air observation would be provided by the dense broadleaf evergreen forests, and good concealment from ground observation would be provided by the dense undergrowth along streams. Movement on foot is feasible, although along streams it would be slowed by trees, bushes, and vines and at times, by miry ground and flooding. Foraging is hazardous because the streams are infested with crocodiles. Wild berries, fruits, and cultivated crops of bananas, cassava, rice, and sweet potatoes afford abundant food supplies; also, fish are plentiful in the streams. Water is abundant, although the taste and odor may be objectionable because of the high organic content and acidity; near towns and larger villages streams are sometimes bacterially contaminated. Shelter and fuel materials are readily available from the dense forests. Cultivated clearings are the only sites suitable for the airdrop of supplies.

2. Northern Savanna Plains

Seasonally, the rolling or dissected surfaces are suitable for large-scale conventional ground operations. Cross-country movement of tracked and wheeled vehicles would be easy in the interstream areas, but direction of movement would be restricted locally by steep streambanks and streams too deep to ford. During April through October, the rainy season, movement would be hindered frequently for short periods by miry ground. Much maintenance of the widely spaced roads would be required to support sustained military traffic. During the rainy season, traffic would be hindered frequently by miry ground, washouts, and, in places, by flooding. Many unbridged streams, ferry crossings, and low-capacity

bridges are potential bottlenecks. Offroad dispersal would be easy in most places. New roads could be constructed in most areas on firm foundations; alignments and clearing would be easy, and only moderate amounts of grading would be required. Blasting, however, would be needed in scattered areas where laterite and hard rocks are near the surface. Sand and gravel suitable for base and surface courses and aggregate are available in many watercourses; in addition, the laterite and hard rock are suitable for crushing. Most roads would require numerous bridges and culverts, and during the rainy season construction would often be hampered by miry ground. Scattered clumps of trees and narrow bands of thick vegetation along streambanks afford concealment from air observation, and the dense tall grass provides concealment from ground observation. Some cover from flat-trajectory fire would be afforded by streambanks and, in the more dissected parts of the region in the east, by surface irregularities. Tunnel-type installations having short entries and unsupported spans could be built along scattered stream valleys in the east, but the less dissected western parts of the region are generally unsuited because of insufficient slope. Bunker-type installations having stable walls could be constructed in many places, although power equipment would be needed where the laterite is near the surface.

In most places, airborne and airmobile operations are possible. Numerous sites are suitable for parachute drops and landings of helicopters. Assault-type aircraft could land at an airfield near Libenge. New airfields could be constructed in many places with unrestricted approaches, little clearing, and small amounts of grading, but blasting would be required at some sites where laterite and hard rock are near the surface.

Irregular forces would encounter some difficulties within the region. Concealment from air observation would be limited to scattered clumps of dense trees and to narrow belts of thick vegetation along streams, but good concealment from ground observation would be afforded by tall grass, especially during the rainy season, when the grass is very dense. There are few obstructions to movement on foot except locally by streams too deep to ford. Wild berries and fruits are generally scarce, but fish are abundant in most streams. Limited amounts of corn and other cereals, cassava, peanuts, and bananas would be available in scattered villages. Water is generally plentiful except during the dry season, November through March, when sources are as much as 15 miles apart; bacterial contamination of water sources is common. Shelter

and fuel materials are available only from scattered stands of dense trees and riverine thickets. Supplies could be airdropped easily in most of the region.

3. Southern Savanna Plains

Conditions for large-scale conventional ground operations are unfavorable in most of the region. Cross-country movement would be hindered in many places by steep-sided valleys, by numerous broad and deep rivers, by scattered stands of dense brush in the southeast, and during the rainy season, November through March, by frequent short periods of miry ground and extensive flooding. Onroad movement would be feasible on the widely spaced earth roads during the dry season, but considerable maintenance would be needed for sustained military traffic. During the rainy season, movement would be halted frequently by miry surfaces, flooding, and many unbridged streams too deep to ford. Low-capacity, single-lane bridges along most roads are potential bottlenecks. Movement would be easy, however, on a few, hard-surfaced roads near some of the larger towns. Offroad dispersal would be easy except at times during the rainy season, when the ground is miry. New roads could be constructed with few alignment problems, easy clearing, and moderate to small amounts of grading, although numerous bridges with raised approaches would be needed. Concealment from air observation would be provided by scattered stands of dense brush in the southeast and narrow bands of thick forests along many streams. Good concealment from ground observation would be provided by the tall grass. Cover from flat-trajectory fire would be afforded by streambanks and, in places, by surface irregularities. There are few sites suitable for tunnel-type installations because of inadequate overhead rock cover, low relief, and unstable and deeply buried rocks. Bunker-type installations could be constructed in many places in thick, stable soils, although excavations would be hindered locally by laterite and hard rock.

Conditions are favorable in most places for airborne and airmobile operations. There are many sites suitable for parachute drops and helicopter landings except in parts of the southeast, where stands of dense brush, some marshes, and small hills limit potential sites. Assault-type aircraft could land at airfields near Kinshasa, Likasi, Kamina, and Kananga. Additional airfields, having unrestricted approaches and runway orientations and requiring only small amounts of clearing and grading, could be constructed in most places on firm foundations. In places, grading would

be difficult and blasting necessary because of laterite and rock at or near the surface. Sand and gravel suitable for construction are available in many places, and hard rock suitable for aggregate and laterite suitable for crushing are available in some areas. The lack or scarcity of water at some sites during the dry season, May through September, would hinder construction.

Irregular forces would encounter approximately the same difficulties in this region as in the Northern Savanna Plains. In addition, movement on foot could be hampered by soft ground and flooding, streams infested with crocodiles would be hazardous to ford, and retrieval of air-dropped supplies could be hindered locally within the region by deep streams and dense brush.

4. Eastern Highlands

High hills and rugged mountains hamper large-scale conventional ground operations in this region. Cross-country movement of tracked and wheeled vehicles would be precluded by steep slopes; onroad movement would be limited to widely spaced earth roads and tracks, which would deteriorate rapidly under sustained military traffic, and would be hindered by steep grades, sharp curves, and occasional landslides. Ferry crossings and fords are potential bottlenecks. Construction of additional roads would be difficult because of severely restricted alignments and the need for numerous sharp curves, steep grades, and much grading, bridging, and blasting. In addition, extensive clearing of dense forests in the central part of the region and of scattered areas of brush in the south would be necessary. Concealment from air observation would be afforded by dense broadleaf evergreen forest, brush, and patches of thick bamboo. Concealment from ground observation would be provided in places by tall grass, especially during the rainy seasons, April through October north of the Equator and November through March south of the Equator. Cover from flat-trajectory fire would be afforded in many places by high streambanks and surface irregularities. In most places, unstable rock and the need for long adits would limit construction of tunnel-type installations. Soils are too thin for the construction of bunker-type installation.

The region is predominantly unsuited for airborne and airmobile operations. Sites suitable for parachute drops and helicopter landings are restricted to the lower grass-covered hill slopes and a small area of plains in the south. Assault-type aircraft could land at a few airfields, but utilization of these fields would be hampered by restricted approaches. Construction of

additional airfields would be difficult in most places because of restricted approaches and runway orientations, the need for extensive grading, excavating, and filling, extensive clearing of dense forest in some areas, and poor drainage where surfaces are relatively gentle. Sand, gravel, water, and hard rocks suitable for crushing are generally available within short distances.

Terrain conditions are predominantly good for irregular force operations. Good concealment would be afforded in the central part of the region by dense forests, in the south by scattered stands of bush, and by small areas of bamboo. Tall grass also would provide good concealment from ground observation, especially during the rainy seasons. Extensive areas of steep slopes provide cover from flat-trajectory fire. Movement on foot would be possible everywhere, but generally would be slow and difficult. Wild berries, tropical fruits, fish, and scattered fields of grain crops would be the major source of food supplies; in general, plentiful supplies of water are available, but most are bacterially contaminated. Materials for fuel and shelter are available in the forested areas. Supplies could be airdropped only at scattered sites in the valleys.

5. Western Highlands

The low hills and rolling or dissected plains do not favor large-scale conventional ground operations. Cross-country movement of tracked and wheeled vehicles would be restricted and in places precluded by steep-sided valleys and by scattered areas of dense forest. Onroad movement would be limited to a two-lane, bituminous-surfaced road paralleling the Congo River and a few unsurfaced roads and tracks, which are impassable in places after heavy rains. A ferry at Matadi could be a serious bottleneck. Construction of new roads would be difficult because alignments would be restricted by steep slopes; and numerous sharp curves, steep grades, much grading, and many bridges and culverts would be needed. In addition, in the plains roads must be built on high embankments because of flooding. The Congo River is navigable by oceangoing vessels as far as Matadi. Concealment from air observation would be afforded by scattered dense broadleaf evergreen forests, mainly in the plains near the coast and along streams in the hills. Elsewhere, tall grass would afford concealment from ground observation, but during the dry season the danger of conflagration is great. Construction of tunnel-type installations would be difficult because of poor rock stability and the need for long adits and

shafts. Bunker-type installations could be built in places near the coast, but shoring would be required.

Conditions are predominantly unsuited for airborne and airmobile operations. There are few sites suitable for parachute drops and helicopter landings because of steep slopes, areas of dense forest, and marsh and swamp near the coast. A few sites are available on the lower hill slopes and on a few interstream areas in the rolling or dissected plains. Assault-type aircraft could land at an airfield near Banana. Construction of airfields would be generally difficult because of the need for much grading, excavating, and fill material, and in the plains near the coast, poor foundations would hinder construction; also, approaches would be restricted.

In much of the region, conditions are poor for irregular force operations because of limited concealment from air and ground observation and poor cover. Only in the northwest, where there are dense forests and steep slopes, are conditions excellent for concealment from air and ground observation and good for cover. Food supplies are limited to corn and other cereals and cassava, which are grown near villages. Water supplies are plentiful but bacterially contaminated. Abundant shelter materials are available only in the dense forests, which primarily are in the northwest. Supplies could be airdropped on scattered small, predominantly grass-covered plains and rolling hills.

The coast of the region is unsuited for large-scale amphibious operations because of encumbered approaches, poor exits, and unfavorable coastal terrain. Offshore approaches are mostly clear, but nearshore approaches are partly obstructed by shoals and reefs and by floating debris near the Congo River mouth; the flat nearshore bottom gradients would also hinder most operations. The coastal terrain consists of a low swampy plain extending up to 6 miles inland, after which appear low hills and plains dissected by numerous marsh-fringed streams. Most coastal areas are fringed by sandy shores interrupted by scattered rocky outcrops and several stream mouths; bluffs closely back shores along the central and southern parts of the coast. Except in the south, exits are generally poor; movement farther inland would be restricted to a few roads and tracks across swampy terrain.

C. Strategic areas (C)

Zaire has two strategic areas, Bas-Zaire and Shaba (Figure 11). These contain the largest cities and are the key industrial, mining, communication, and political centers.

1. Bas-Zaire

This strategic area (Figure 12) contains the country's only ports for oceangoing ships, most of the light industry, and the largest concentration of storage facilities for refined petroleum products, the only crude oil storage facilities, and the only long-distance petroleum pipelines.

Kinshasa (population about 1.3 million in 1970), the capital and largest city, is the main river port and transshipment point on the Congo River and the chief commercial, telecommunication, and military center in the country. Important installations include railroad repair shops, machinery repair shops, three small shipyards, and factories producing steel drums and tin cans, textiles, shoes, tile, palm oil, and plywood. There are storage facilities for over 600,000 barrels of refined petroleum products and large covered storage facilities. Two refined petroleum products pipelines from Matadi (one from Ango Ango and one from Matadi proper) terminate at Kinshasa. Southeast of Kinshasa is one of the largest civil airfields in Africa.

Matadi (population 110,000 in 1970), located at the head of navigation for oceangoing ships on the Congo River, is the principal port for the country, and at nearby Ango Ango there are storage facilities for 503,000 barrels of refined petroleum products. Boma (population 63,000 in 1970), downstream from Matadi, is the second largest maritime port and has ship repair facilities. At Muanda there are facilities for 435,000 barrels of crude oil and 218,000 barrels of refined petroleum products and an oil refinery that has a throughput capacity of 13,800 barrels a day. About 6 miles east of the town there is a military airfield. In addition, Lukala has one of the largest cement plants in the country.

2. Shaba

This strategic area, adjoining the copperbelt of northern Zambia, contains one of the largest copper reserves in the world (Figure 13). Numerous mines, mostly open pit, are located in a narrow belt extending from near Kolwezi to the vicinity of Lubumbashi. These mines produce about 400,000 tons of copper ore a year, and the country is the fifth largest producer in the world. In addition, generally more than half of the world production of cobalt, most of the germanium, and important quantities of zinc and lead ore are produced as byproducts of copper mining. Near Likasi and Kolwezi are large electrolytic refineries.

Lubumbashi (population 318,000 in 1970), is the second largest city in the country and has a copper

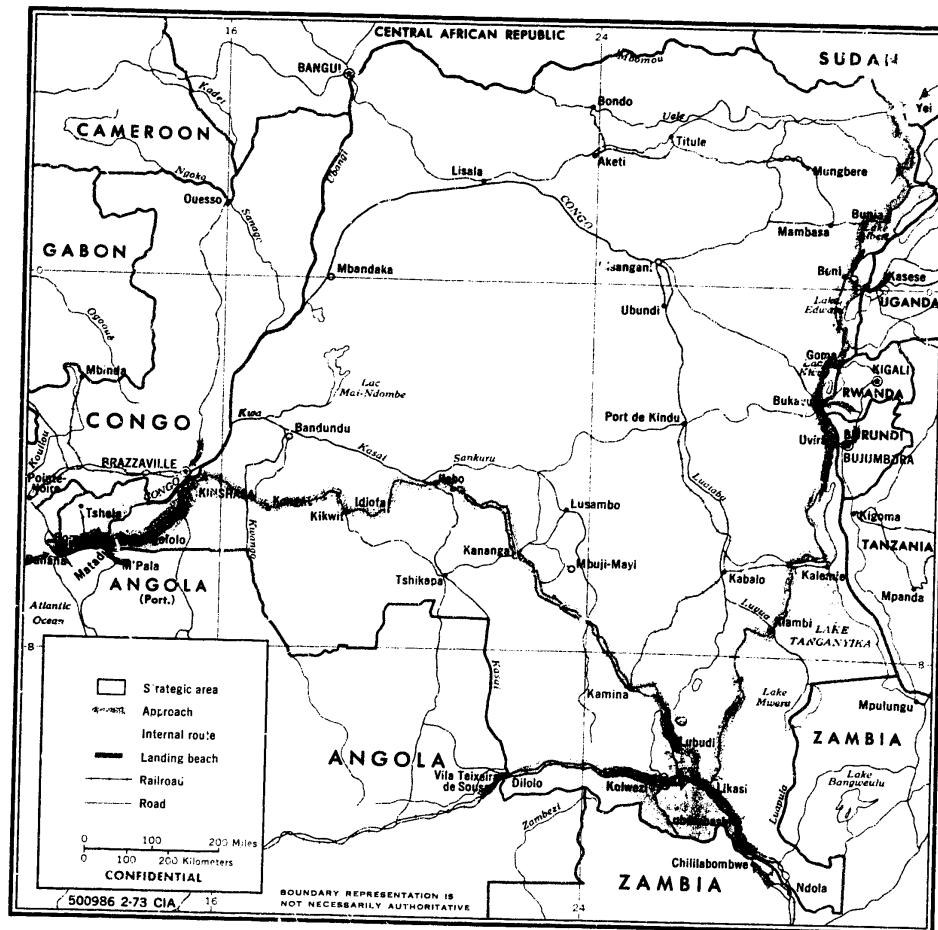


FIGURE 11. Strategic areas, internal routes, and approaches (C)

smelter, railroad repair shop, and storage facilities for 38,000 barrels of refined petroleum products. Three civil airfields are near the city.

Likasi (population 146,000 in 1970) and Kolwezi (population 58,000 in 1970) are also important mining and transportation centers. At Kolwezi there is storage for 60,000 barrels of refined petroleum products. At Likasi are a lead and copper smelter, an oxygen plant, and machinery repair shops, and nearby are an explosives factory and a cement plant. The strategic

area has about half of the total electric power in the country.

An important town outside the strategic area is Kisangani (population 230,000 in 1970). This city, located at the head of navigation on the Congo River, is the fourth largest city, the third largest port in the country, and an important transshipment point and railroad terminus. Important industrial establishments include a railroad repair shop, ship repair yard, flour mill, soap factory, sawmill, brickworks, and an

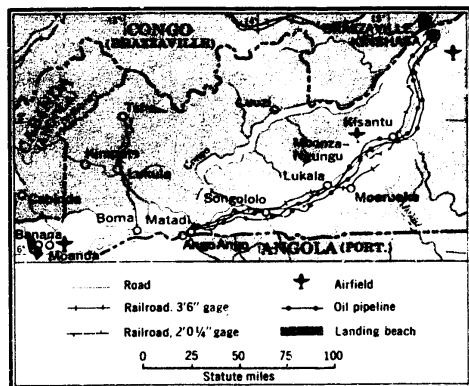


FIGURE 12. Bas-Zaire strategic area (C)

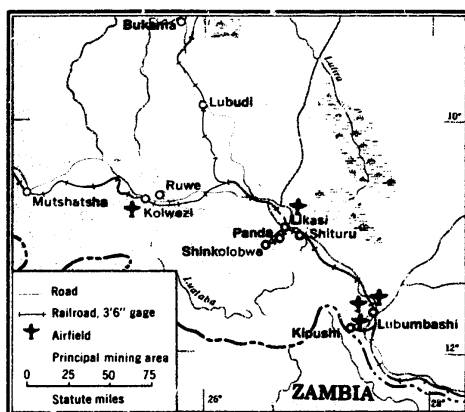


FIGURE 13. Shaba strategic area (C)

aluminum utensil factory. There is storage for about 38,000 barrels of refined petroleum products.

D. Internal routes (C)

The internal routes (Figure 11) afford the easiest avenues of movement from the best land approaches to the strategic areas, between the strategic areas, and from the amphibious landing area to urban centers in the Bas-Zaire strategic area. Data on individual routes are contained in Figure 14.

E. Approaches

The perimeter, 6.153 miles, is mostly along streams and across lakes; there are 23 miles of coastline. None of the borders is fortified or in dispute. The country claims 12 nautical miles as offshore territorial waters. Data on individual boundaries are given in Figure 15. (U/OU)

1. Land (C)

In most places, cross-country movement in the border zones would be restricted or precluded by steep slopes, dense forests, extensive swamps, and broad lakes. Along most of the Congo and Central African Republic borders and parts of borders elsewhere, movement would be obstructed by broad and deep rivers. Along stretches of the borders with Sudan and Zambia, however, cross-country movement would be fairly easy on the savanna plains, except for frequent short periods during the rainy season, when miry ground and local flooding are common. Roads crossing the borders are widely spaced and are mostly earth or light gravel. The road in the approach from Zambia is bituminous surfaced. The road in the approach from Burundi is gravel surfaced and impassable because of erosion by Lake Tanganyika. In addition, there are single-track, 3'6"-gage railroads from Angola and Zambia. The approaches shown in Figure 13 are the best means of access to Zaire. The approach from Brazzaville is directly across the Congo River to Kinshasa. The present ferry plying the river between these two ports has a capacity of about 16 tons. Figure 16 provides data on individual land approaches.

2. Sea (C)

Large-scale amphibious operations would be hampered by encumbered approaches, occasionally heavy surf, and flat nearshore bottom gradients. Offshore approaches are clear. Nearshore approaches are partly obstructed, mostly by shoals and reefs and at times by logs and debris near the Congo River mouth. Nearshore bottom material is primarily sand and mud with some rock; gradients are generally flat. Surf 4 feet or higher can be expected to occur approximately 15% to 20% of the time throughout the year. Tides are semidiurnal, and the spring range is about 4 1/2 feet. The fairly regular coastline is fringed by predominantly sandy shores interrupted by several streams and short stretches of rock outcrops; bluffs closely back some stretches, particularly in the southern half. Four sandy beaches fringe the coast.

FIGURE 14. Internal routes (C)

ROUTE	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
Links approach from Yei, Sudan, to Likasi in Shaba strategic area. Traverses mainly rounded hills covered by grass except between Beni and Kalemie, where the route is mostly across rugged grass-covered mountains.	One to two lanes, earth or light gravel surface in poor to fair condition except from Uvira to north of Bukavu, where bituminous surfaced and in good condition. Movement slowed in many sections by sharp curves and steep grades and hindered at times during April through October by flooding. Ferry crossing at Kiambi potential bottleneck.	None.....	Generally hindered or precluded by steep slopes. Feasible on low hills north of Bunia and on plains near Uvira. Hindered by flooded sections near border during and after heavy rains.
Connects approach from Kasese, Uganda, to route from Sudan at Beni. Mainly across flat plains covered by tall grass and some areas of dense broadleaf evergreen forest and bamboo; near border, traverses rugged mountains.	One to two lanes, gravel surface, in fair condition. Movement slowed near border by numerous sharp curves and steep grades.	None.....	Generally easy except where hindered locally by steep slopes and areas of dense forest and bamboo.
This route, only about 2 miles long, connects approach from Kigali, Rwanda, to route from Sudan on western edge of Bukavu. Follows shore of Lac Kivu.	Two lanes, light gravel and laterite, in fair condition.	None.....	Precluded in most places by built-up areas.
Links approach from Bujumbura, Burundi, to route from Sudan at Uvira. Across flat grassy plains.	Two lanes, gravel surface, in poor condition; presently impassable because of erosion by lake.	None.....	Easy except at times during rainy season, November through March, when ground is miry.
Connects approach from Chililabombwe, Zambia, to Lubumbashi. Across hills and rolling or dissected plains covered by brush and grass.	One to two lanes, bituminous surface, in good condition.	Single track, 3'6" gage, in good condition; closely parallels road for most of route.	Feasible in most places; hindered locally by steep slopes.
Connects approach from Vila Teixeira de Sousa, Angola, to route between Kinshasa and Lubumbashi near Likasi. Across rolling or dissected plains covered by brush and grass.	West of Kolwezi, mostly one lane, earth, and in poor condition; during rainy season, November through March, movement slowed at times by miry surfaces and washouts; several narrow, low-capacity bridges potential bottlenecks. Between Kolwezi and Likasi, two lanes, bituminous surface, in good condition.	Single track 3'6" gage, in good condition; closely parallels road.	Fairly easy in most places; direction restricted locally by steep-sided, north-south valleys.
Links approach from M'Pala, Angola, to Kinshasa through Matadi. Crosses low hills and rolling and dissected plains covered by grass and patches of dense forest.	From border to Matadi, one lane, earth, poor condition; Matadi to Kinshasa, two lanes, bituminous surface, in good condition. In some sections, sharp curves and steep grades common.	Single track, 3'6" gage, in good condition; between Matadi and Kinshasa closely parallels road.	Restricted in most places by steep slopes.

FIGURE 14. Internal routes (C) (Continued)

ROUTE	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
Leads from landing beach near Banana to Matadi. Near coast, crosses low plains with marsh and swamp areas; from near Boma to Matadi, across low hills and rolling and dissected plains covered by grass and patches of dense forest.	From beach to Boma, one to two lanes, predominantly earth, in poor to fair condition; remainder mostly two lanes with bituminous surface in good condition except for some stretches where gravel and single lane, in fair condition. After heavy rains movement slowed or halted for short periods by flooding in some areas and by miry ground in the earth sections. Ferry at Matadi potential bottleneck.	None	Hindered in places by steep-banked streams, by miry ground in marshes and swamps, and by stands of dense broadleaf evergreen forest.
Links Kinshasa and Lubumbashi. Traverses predominantly grass-covered, rolling or dissected plains.	Between Kinshasa and Kenge and between Lubudi and Lubumbashi, two lanes, bituminous surface, in good condition. Elsewhere, mainly earth and in poor condition; some stretches of laterite and gravel. In places, traffic slowed by sharp curves and steep grades. Movement slowed at times during rainy season, November through March, by miry surfaces and during dry season, May through September, by loose sand between Idiofa and Kenge. Fords, ferries, and several narrow bridges potential bottlenecks.	Single track, 3'6" gage, in good condition; between Ilebo and Lubumbashi.	Easy in some areas where surfaces rolling and grass covered; however, in places hindered by dissected surfaces, by broad and deep streams, and frequently during rainy season by miry ground and flooding along streams.

FIGURE 15. Boundaries (U/OU)

BOUNDARY	LENGTH (IN MILES)	STATUS	TERRAIN
Angola and exclave of Cabinda.	1,485, including 140 with Cabinda.	Demarcated, in places by Congo, Kwango, and Kasai rivers.	Mainly across rolling and dissected plains covered by savanna; along Cabinda border mostly dense broadleaf evergreen forest. In west, partly across hills.
Congo.....	1,010.....	Demarcated, mainly by Congo and Ubangi rivers.	North of confluence with Kwa, mostly flat plains covered by broadleaf evergreen forest and marsh; south of confluence, rolling or dissected plains and hills covered by savanna.
Central African Republic.	855.....	Demarcated by Ubangi and Bomu rivers.	Mainly rolling or dissected plains covered by savanna; narrow bands of dense broadleaf evergreen forest along the streambanks.
Sudan.....	390.....	Demarcated.....	Low hills and rolling plains covered by savanna.
Uganda.....	475.....	Demarcated, although in Lake Edward and Lake Albert demarcation is determined by geometric line.	Across flat to rolling plains, hills, and rugged mountains covered chiefly by short and tall grass; south of Lake Albert, crosses areas of dense broadleaf evergreen forest and an area of marsh.
Rwanda.....	135.....	Demarcated except across Lac Kivu, where demarcation determined by geometric line.	Hills and rugged mountains covered by patches of bamboo and alpine brush and scrub.
Burundi.....	145.....	Demarcated by Ruzizi river except for 80 miles across Lake Tanganyika, where demarcation determined by geometric line.	Narrow, flat valley plain in south and rugged mountains in north; mostly grass covered.
Tanzania.....	285.....	Demarcated by geometric line near center of Lake Tanganyika.	
Zambia.....	1,350.....	Demarcated except between Lake Mweru and Lake Tanganyika, where indefinite. Nearly a third formed by Luapula river; parts across Lake Mweru and Lake Tanganyika demarcated by geometric lines.	Flat to rolling plains covered by grass and open to moderately dense deciduous forest. Luapula traverses marshy area for about 75 miles south of Lake Mweru.

ranging from 600 yards to 6 miles in length. Gradients are primarily steep and all are backed by a low swampy plain. Exits from the beaches are by tracks, trails, loose-surfaced roads, or cross-country to a sparse inland road net.

The landing beach shown in Figures 12 and 13 provides direct access to the Bas-Zaïre strategic area. It extends northwestward from the minor port of Banana and is about 5 miles long. Seaward of the 5-fathom curve, offshore approaches are generally clear; shoreward, the nearshore approaches are partly obstructed by shoals and reefs and possible pilings close off the south end of the landing area. Nearshore bottom materials are primarily sand and mud with some rock; gradients are flat and preclude dry-ramp LST landings. Surf 4 feet or higher can be expected to occur from 15% to 20% of the time throughout the year. Tides are semidiurnal with spring ranges of about 4½ feet. Beach material is primarily fine sand,

which is firm when wet and soft when dry. Widths range from 25 to 50 yards at low water and from 5 to 30 yards at high water. Gradients are mostly steep. The beach is immediately backed by a discontinuous bluff behind the center and northwestern parts, then backed by a low swampy plain extending approximately 5 miles inland to a low escarpment and dissected low hills. Exits are directly to a hard surfaced road closely paralleling the coast. Engineering effort may be required to exit where bluffs closely back the beach.

5. Air (U/OU)

The air approaches² to Zaïre from north of the equator are over northeastern Gabon, southeastern Cameroon, northern Congo, Central African

²The discussion zone for air approaches extends approximately 300 nautical miles beyond the borders of Zaïre.

FIGURE 16. Land Approaches (C)

APPROACH	ROAD	RAILROAD	OFFROAD DISPERSED AND CROSS-COUNTRY MOVEMENT
From Yei, Sudan, to border. Across hills and rolling plains covered mainly by savanna.	Two lanes, gravel surface except near border, where earth; condition fair in gravel sections, poor in earth.	None	Restricted in places by steep slopes; during rainy season, hindered for short periods by miry ground and precluded locally by flooding.
From Kasere, Uganda, to border near northern end of Lake Edward. Traverses rolling plains and, near border, rugged hills covered by tall grass savanna.	Two lanes, gravel surface, in fair condition. Near border, sharp curves and steep grades common.	None	Generally easy on plains; precluded in places by steep slopes or hills near border.
From Kigali, Rwanda, to border at Bukavu. Crosses hills and rugged mountains covered by savanna.	One to two lanes, light gravel and laterite, mostly fair condition. Numerous sharp curves and steep grades.	None	Generally restricted or precluded by steep slopes.
Bujumbura, Burundi, to border near Uvira. Mainly across flat rift valley plain covered by grass and cultivated crops.	Two lanes, bituminous surface in good condition. Narrow bridge near border potential bottleneck.	None	Fairly easy, although hindered at times during rainy season by miry ground.
From Chililabombwe, Zambia, to border. Crosses gently rolling plains covered mostly by open deciduous forest and grass.	Two lanes, bituminous surface, in good condition.	Single track, 3'6" gage, in good condition. Closely parallels road, terminating at border.	Fairly easy during dry season; hindered at times during rainy season by miry ground.
From Vila Teixeira de Sousa, Angola, to border. Traverses dissected plains covered mainly by deciduous forest and grass.	One to two lanes, earth, in generally poor condition. Movement slowed at times during rainy season by miry surfaces.	Single track, 3'6" gage, in good condition. Closely parallels road.	Generally easy; hindered locally by deciduous forest and during rainy season by short periods of miry ground.
From M'Pala, Angola, to border near Matadi. Crosses low savanna-covered hills.	Two lanes, gravel surface, in fair condition.	None	Hindered in places by steep slopes.

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Republic, southern Sudan, northern and central Uganda, and westernmost Kenya; the approaches from south of the equator are over southern Uganda, Rwanda, Burundi, western Tanzania, northern and central Malawi, west central Mozambique, Zambia, northernmost Rhodesia, northern and central Angola, central and southern Congo, southern Gabon, and a small part of the South Atlantic Ocean.

Weather conditions are more favorable in the approaches from south of the Equator, and the best period for flying is May through October, when the average cloud cover ranges from about 35% to 75%, and thunderstorms usually occur on less than 5 days per month. During the remaining months, average cloudiness ranges from 55% to 90%, and thunderstorms occur on 5 to 25 days per month. In the approaches from north of the Equator, the most favorable weather conditions occur in December through February, when cloudiness and thunderstorm

activity reach a minimum. During these months, average cloudiness ranges from about 35% to 65%, and thunderstorms occur on less than 5 days per month at most places. During the remaining months, the average cloudiness ranges from about 60% to 90%, and thunderstorms occur on 5 to 20 days per month. However, some stations in the lake area of the eastern approach report over 200 thunderstorm days per year. In all approaches, thunderstorms are frequently attended by severe turbulence, which may extend up to 50,000 feet; cloud icing, hail, and severe lightning are also present. The average height of the freezing level everywhere is approximately 15,000 to 16,000 feet throughout the year. Upper-air winds are generally light except over the northeast approaches in June through August, when easterly winds reach and occasionally exceed 50 knots between about 45,000 and 50,000 feet.

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Places and features referred to in this General Survey (U/OU)

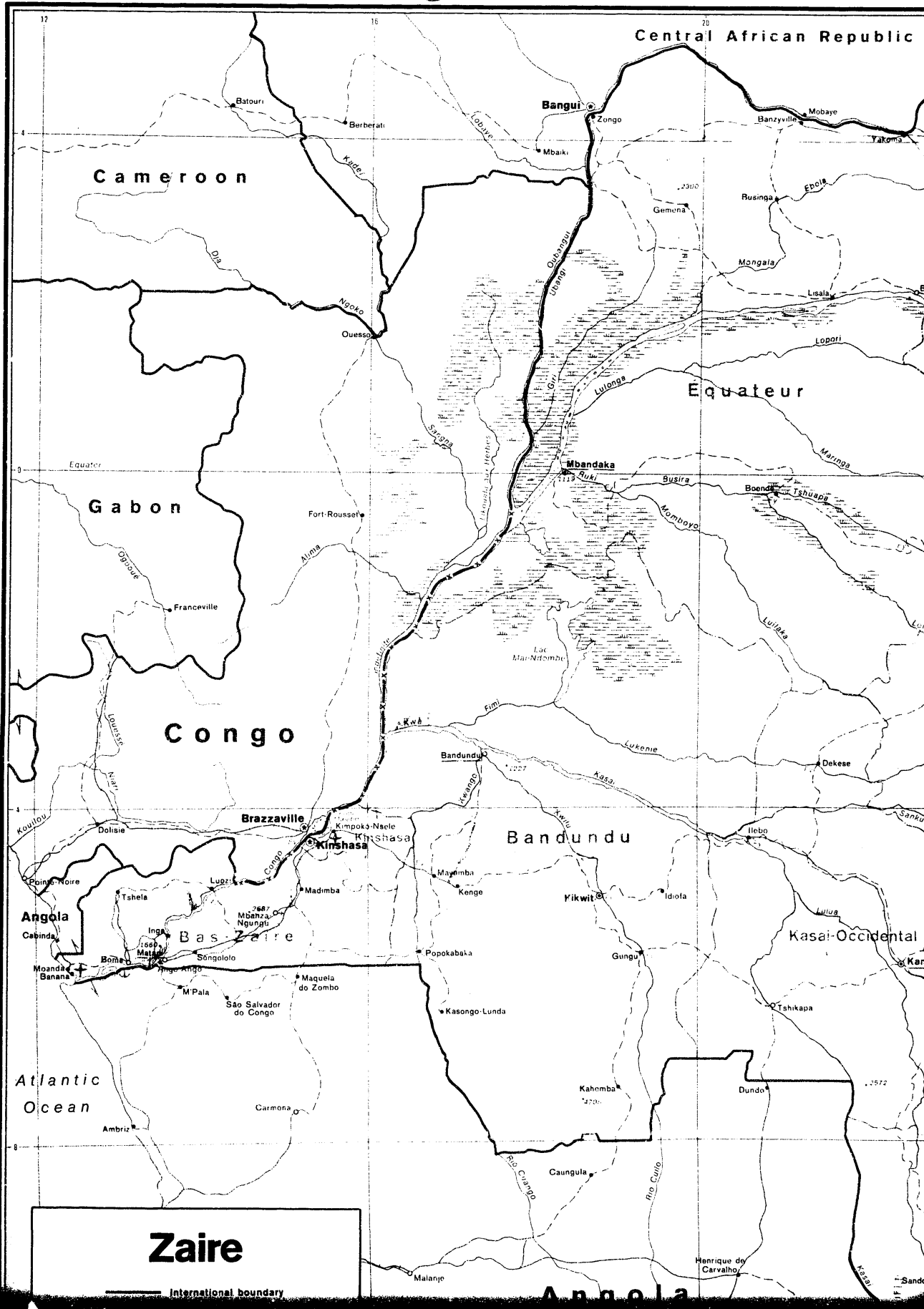
	COORDINATES			COORDINATES	
	° 'S.	° 'E.		° 'S.	° 'E.
Aketi.....	2 44N.	23 46	Lake Albert (lake).....	1 40N.	31 00
Akula.....	2 22N.	20 11	Lake Edward (lake).....	21	29 35
Anjo Anjo.....	5 51	13 26	Lake Mweru (lake).....	9 00	28 45
Bafwasende.....	1 05N.	27 16	Lake Tanganyika (lake).....	6 00	29 30
Banana.....	6 01	12 24	Libenge.....	3 39N.	18 38
Bandundu.....	3 19	17 22	Lienart.....	3 04N.	25 31
Bangui, Central African Republic.....	4 22N.	18 35	Likasi.....	10 59	26 44
Beni.....	0 30N.	29 28	Lisala.....	2 09N.	21 31
Binza.....	1 03	28 54	Lobito, Angola.....	12 20	13 34
Black River (strm).....	3 57	15 54	Lomami (strm).....	0 46N.	24 16
Boende.....	0 13	29 52	Lualaba (strm).....	0 26N.	25 20
Boma.....	5 51	13 03	Luapula (strm).....	9 26	28 33
Bomu (strm).....	4 08N.	22 27	Lubudi.....	9 57	25 58
Bondo.....	3 49N.	23 40	Lubudi (rr sta).....	9 57	25 57
Brazzaville, Congo.....	4 16	15 17	Lubumbashi.....	11 40	27 28
Budjala.....	2 39N.	19 42	Luenia.....	9 27	25 47
Bujumbura, Burundi.....	3 23	29 22	Lukala.....	5 31	14 32
Bukama.....	9 12	25 51	Lulu (mine).....	10 38	25 21
Bukavu.....	2 30	28 52	Lulimba.....	4 42	28 38
Bumba.....	2 11N.	22 28	Madula.....	0 28N.	25 23
Bunia.....	1 34N.	30 15	Mambasa.....	1 21N.	29 03
Busanga.....	10 12	25 23	Maniema.....	1 11	28 37
Businga.....	3 20N.	20 53	Manono.....	7 18	27 25
Buta.....	2 48N.	24 44	Masina.....	5 52	17 03
Chililabombwe, Zambia.....	12 22	27 50	Matadi.....	5 49	13 27
Congo River (strm).....	6 04	12 24	Mayamba.....	4 46	16 46
Crique de Banana (tidal creek).....	5 01	12 25	Mayumbe (massif).....	4 30	12 30
Dilolo.....	10 42	22 20	Mbandaka.....	0 04N.	18 16
Djeio-Binza.....	4 23	15 15	Mbanza-Ngungu.....	5 15	14 52
Douala, Cameroon.....	4 03N.	9 42	Mbengo-Mbengo (whirlpool).....	5 50	13 26
Fimi (strm).....	3 01	16 58	Mbuji-Mayi.....	6 09	23 36
Fungurume.....	10 37	26 18	Mongala (strm).....	1 53N.	19 46
Gemena.....	3 15N.	19 46	M'Pala, Angola.....	6 08	13 44
Goma.....	1 41	29 14	Nuanda.....	5 56	12 21
Guba.....	10 40	26 26	Mulangwishii.....	10 47	26 37
Idiofa.....	5 02	19 36	Mungbere.....	2 38N.	28 30
Ilebo.....	4 19	20 35	Mushenge.....	4 32	21 21
Inga.....	5 39	13 39	Musoshi.....	12 15	27 38
Isiro.....	2 46N.	27 37	Mutshatsha.....	10 39	24 27
Itimbiri (strm).....	2 02N.	22 44	Mwenga.....	3 02	28 26
Ituri (strm).....	1 40N.	27 01	Ndjili.....	4 28	15 21
Kabalo.....	6 03	26 55	Ndolo.....	3 36	23 03
Kabongo.....	7 24	25 38	Ndolo (see popl).....	4 19	15 19
Kalemie.....	5 56	29 12	Pool Malebo (pool).....	4 15	15 25
Kamina.....	8 44	25 00	Port de Kindu.....	2 57	25 57
Kananga.....	5 54	22 25	Punia.....	1 28	26 27
Kasai (strm).....	3 02	16 57	Ruzizi (strm).....	3 16	29 14
Kasese, Uganda.....	0 10N.	30 05	Sakanina.....	12 45	28 34
Kasongo.....	4 27	26 40	Sake.....	1 34	29 03
Katanti (mission).....	2 18	27 08	Sankuru (strm).....	4 17	20 25
Katonto (hill).....	10 38	25 21	Shitucu (mine).....	11 01	26 46
Kenge.....	4 52	16 59	Sona-Bata.....	4 54	15 09
Kiambi.....	7 20	28 01	Songololo.....	5 42	14 02
Kigali, Rwanda.....	1 57	30 04	Tenke.....	10 35	26 07
Kigoma, Tanzania.....	4 52	29 38	Titule.....	3 17N.	25 32
Kikwit.....	5 02	18 49	Tshela.....	4 59	12 56
Kimpoko-Nsele.....	4 14	15 33	Tshikapa.....	6 25	20 48
Kinkuzu.....	4 58	14 28	Tshinsenda.....	12 18	27 58
Kinshasa.....	4 18	15 18	Ubangi (strm).....	3 30	17 42
Kipushi.....	11 46	27 14	Ubundi.....	0 21	25 29
Kisangani.....	0 30N.	25 12	Uvira.....	3 24	29 08
Kisenge.....	10 41	23 10	Vila Teixeira de Sousa, Angola.....	10 42	22 12
Kitona.....	5 28	17 42	Yei, Sudan.....	4 05N.	30 40
Kolwezi.....	10 43	25 28	Zonzo.....	5 44	14 39
Komba.....	2 53N.	23 59			
Kongolo.....	5 23	27 00			
Kota Koli.....	11 10	27 28			
Kwa (strm).....	3 10	16 11			
Kwango (strm).....	3 14	17 22			
Kwilu (strm).....	5 40	12 52			
Lac Kivu (lake).....	2 00	29 10			

Selected Airfields

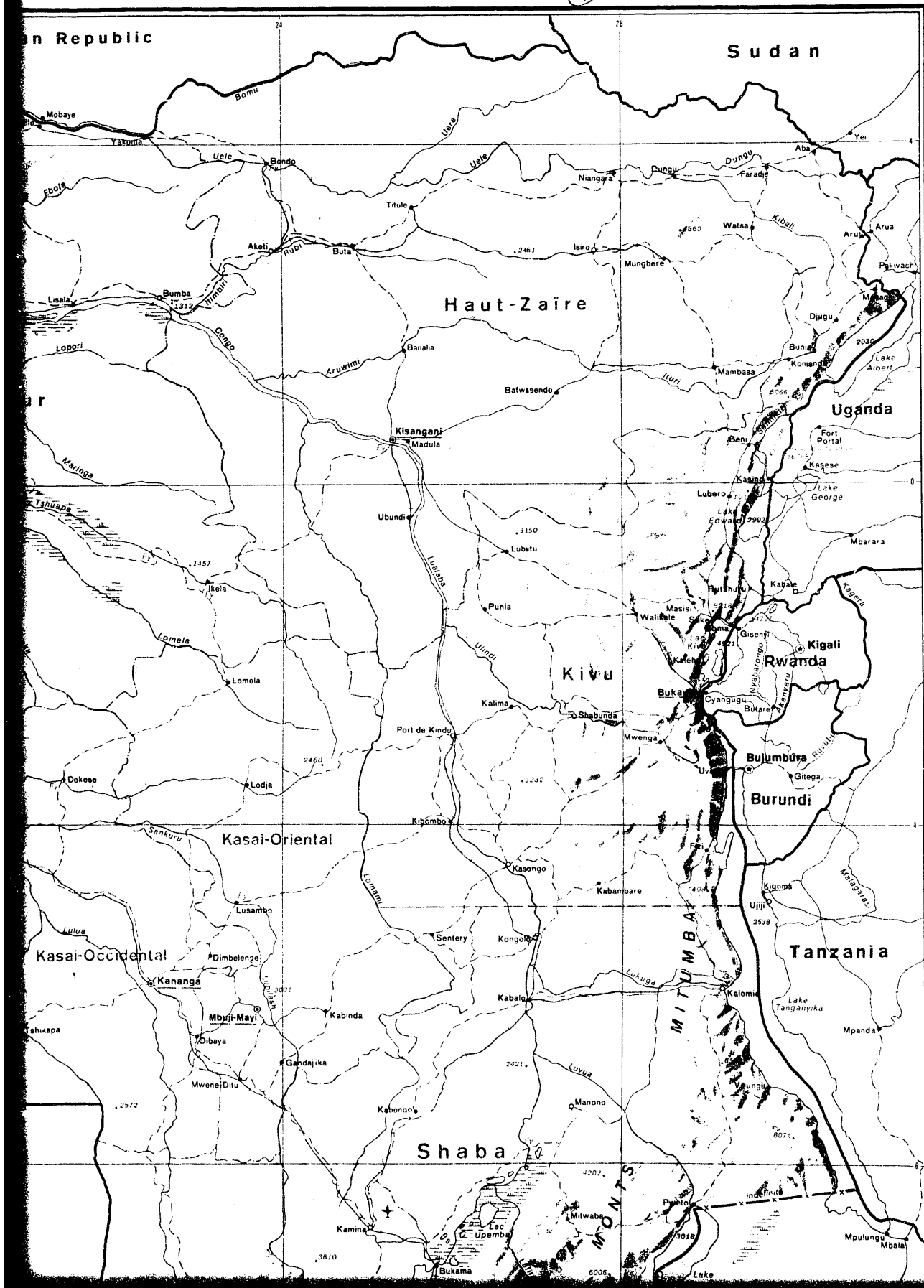
Kamina Base.....	8 38	25 15
Kitona Base.....	5 55	12 27
Lubumbashi.....	11 35	27 32
Ndjili.....	4 23	15 27

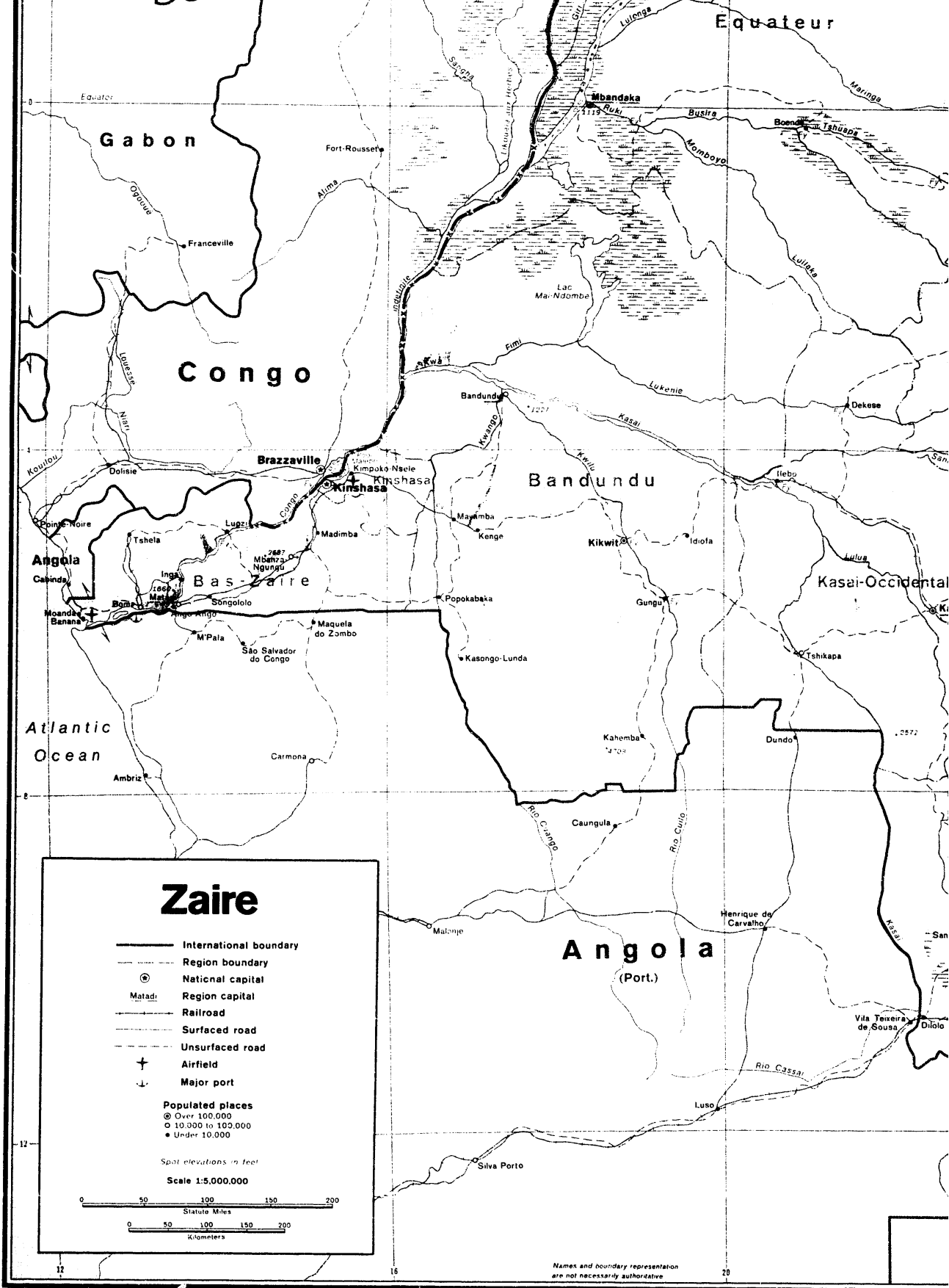
NOTE—All latitudes are south unless otherwise indicated.

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